Review of Khoshnevis and Taborda for BSSA

Earthquake ground motion simulations are usually validated against observational data or empirically-derived solutions. However, exactly which parameters to compare (e.g., peak ground velocity, duration, spectral content) in order to assess the goodness-of-fit, is not always clear. This paper uses machine learning techniques and eleven possible metrics for comparing (recorded and simulated) ground motions to determine the parameters that are most predictive of goodness-of-fit. This is an interesting paper, and will help future researchers prioritize which metrics to focus on when validating ground motions simulations.

The paper is generally well written. As a strong ground motion seismologist (i.e., I assume I'm part of the audience you hope to reach), there is a lot of machine learning-related jargon that makes certain sections difficult to follow. It would also be useful to have some discussion regarding which parameters were found to be repetitive, incase future authors wish to look at more than the four recommended parameters.

L. 8 "… could **focus**…"

L. 11 "…the objective **of**…"

L. 25-41 The frequent use of phrases such as "Among these methods,"; "Among the latter,"; "In this category,"; and "Within this group," make the text difficult to follow.

L. 42-43 I would suggest moving the description of the Anderson (2004) method (i.e., L. 48+) to directly follow this sentence.

L. 59-61/L. 391-394 It should be stated somewhere that this is really intended for **engineering purposes**.

L. 61 This sentence should end with a "?"

L. 98-99 It is not clear how the equation for *S* is applied to values that are a function of period (e.g., the response or Fourier spectrum). Do you follow the guidelines provided by Anderson? If so, what frequency range/bands are you examining?

L. 128/132/137/etc. "… the three component**s**…"

L. 236 Where is the discussion on the consequences of overfitting? The only other place I see overfitting mentioned is L. 328.

L. 236 Remove "A matter we discuss later."

L. 241-243 It is not helpful to list different algorithm names for making decision trees, without any information about them or how they differ.

L. 257-258 I don't understand this sentence. What is a continuous attribute?

L. 259-264 This paragraph contains a lot of jargon.

L. 300 Isn't this also true for the C5-C7 combination?

L. 328 What is "a strong pruning process"?

L. 433 “We present the result**s** of…”

L. 435 “… goal of prioritiz**ing** and reduc**ing**…”

L. 443 Remove “Similarly” or “similar” (redundant)

L. 450 “… remain valid.”

L. 455 “… as the decisive **parameters**…” – (This short concluding paragraph would be much stronger without the use of unnecessary phrases, i.e., “This latter point”, “One the one hand”, “on the other hand.”